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The Effects of Problem-Based Learning on Student Engagement in my Mathematics Classroom

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ACTION Research Project

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Abstract

The main purpose of this research is to see what effects problem-based learning has on student engagement cognitively, behaviorally, and emotionally. Some research has found that problem-based learning increases students' cognitive engagement in the classroom. This research will be conducted over a three week period and analyze student engagement during a traditional unit and a problem-based learning unit.

Introduction

When it comes to the world of education it is tough to find a topic that everyone is in agreeance on. There is, however, one topic that educators can agree is one of the most crucial variables when it comes to students learning, and that is student engagement. The purpose of my research is to examine the effects of problem-based learning on student engagement, specifically

cognitive engagement, behavioral engagement, and emotional engagement. I have picked this topic because I feel that problem-based learning is becoming the new “better” way of teaching and I want to know if it affects students as positively as the research suggests. It is hypothesized that problem-based learning (PBL) will improve student engagement cognitively, behaviorally, and emotionally because PBL is a type of student-centered learning which has been found to increase student motivation and effort leading to an increase in student engagement (TEAL Center staff). I have found that students become more engaged in their learning when they are allowed to have shared control over the learning process compared to a teacher-centered classroom where the teacher is the main focus of the learning process.

Many essential terms will be used throughout this study and to truly understand what this study aims to accomplish it is important to define them. Problem-based learning will be defined as a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge, as defined by PBLworks (PBLWorks). I will also be using the terms cognitive, behavioral, and emotional engagement throughout my research. Cognitive engagement will be defined as “a psychological state in which students put in a lot of effort to truly understand a topic and in which students persist studying over a long period of time” (Rotgans and Schmidt 2011) Behavioral engagement will be observed and defined as students participation and effort in class. Not unlike emotional engagement that will be defined as students' interest and feeling towards what is happening in the classroom. Each of these types of engagement plays a role in students' individual learning processes. This study will show how PBL can affect students' engagement in each of those three areas.

Literacy Review

Rotgans and Schmidt researched to what extent autonomy in problem-based learning results in cognitive engagement. They defined cognitive engagement in the classroom as “a psychological state in which students put in a lot of effort to truly understand a topic and in which students persist studying over a long period of time”(Rotgans and Schmidt 2011). Rotgans and Schmidt examined how this type of cognitive engagement emerges in a problem-based learning classroom. This study consisted of 208 participants who were students, twenty years old, enrolled in science-related modules in Singapore where the primary instructional method was problem-based learning.

The study measured situational cognitive engagement and academic achievement of these participants. To measure situational cognitive engagement researchers had students fill out a survey scored on a 5-point scale that was administered during the five phases in the problem-based learning (PBL) process. The participant's course grades determined academic achievement. When looking at cognitive engagement, researchers found a significant increase in students engagement when students moved from the self-study phase of PBL to the sharing stage. Suggesting that the level of autonomy involved in problem-based learning increases students engagement. This pertains to my research because it gives a reason for why PBL is increasing student engagement. If my PBL unit allows a certain level of autonomy for my students it should increase student engagement when compared to student engagement during traditional teaching instruction.

The study conducted by Delialioğlu took this one step further by comparing the level of cognitive engagement students have in a problem-based blended learning environment to a lecture-based blended learning environment. This study focused on a computer network course over a two-semester period that was implemented as a blended learning course at a large public university. The participants of this study were 93 junior pre-service teachers: 38 enrolled for one semester and 55 for the next semester (Delialioğlu 2012). An online learning environment was blended with a lecture-based instruction for the

first eight weeks of the semester and then the second eight weeks of the semester was blended with a problem-based instruction approach. To measure students' engagement they were given two surveys three different times throughout the course. The first survey was administered at the beginning of the course to measure student abilities and motivational aspects. The second was an engagement survey given at the end of the first half of the course to measure student engagement in blended learning with problem-based instruction. Finally, the same engagement survey was completed at the end of the blended learning with problem-based instruction part of the class.

After analyzing the data, it was found that the level of students engagement outcomes and the total time on task was higher in the problem-based portion of the blended course compared to the lecture-based portion. In comparison to the lecture-based blended learning part of the course, students reported significantly higher use of active learning strategies during the problem-based blended learning part of the course, which leads to an increase in student engagement. Students also spent a greater amount of time on tasks in the problem-based learning portion of the course due to the problem-based learning activities requiring students to actively engage in the learning process compared to the traditional lecture-based method of instruction. While students were satisfied with both types of blended learning for the course, students were more engaged with active learning strategies during the problem-based learning part of the blended course. This study reflects my research by comparing a PBL module to a lecture-based learning module, which is also referred to as traditional instruction. It allows me to compare my research to what was done in this study and see how the conclusions compare.

In a similar study done in Southwestern Virginia, a Javits project funded through the U.S Department of Education followed one group of students from 2nd to 3rd grade. Ten elementary schools participated for a total of 465 students in 31 different classrooms (Boren 2012). Five randomly assigned schools participated in a PBL mathematics unit for both years, and five randomly assigned schools participated as a control group with only traditional instruction in their classrooms. Throughout the two

years all students answered surveys that gauged their engagement and self-efficacy in math during the units. Data was also collected via video observations, journals, and student artifacts.

The qualitative research found that the classroom with the highest engaged students was a more student-centered classroom. Meaning the teacher allowed the students to have the autonomy necessary to become deeply invested in the material and established an environment where students felt comfortable and confident enough to ask questions and show their work. The students were the focus of the lesson. Whereas the classroom with the lowest engagement levels and self-efficacy was a more teacher-centered classroom. Meaning the teacher was the focus of the lesson. When it came to students work the teacher was more controlling and students relied on her for permission and help to move forward in the unit. My research is based on the knowledge of teacher vs student based instruction so this study supports my theory of a student-centered increasing engagement when compared to a teacher-centered classroom.

Problem-based learning can be incorporated into a classroom in many ways. A study done by Reynolds explored the impact of combining problem-based learning with culturally responsive pedagogy on the engagement of African American students. The participating were 4-5 high school classrooms with teachers who have completed a professional development course focused on developing culturally responsive PBL's in Cleveland, Ohio (Derham 2012). The qualitative research was collected through two interviews; one conducted halfway through the unit and the second after the end of the unit.

Through the collection of the data, it was identified that there were multiple aspects of the unit that lead to the increase of student engagement. One was the autonomy allowed within the culturally responsive PBL unit. A common theme among the research done with problem-based learning. Another was the multiple instructional strategies the teacher developed to differentiate throughout the CRPBL unit. Lastly, the student's emotional attachment to the problem increased student engagement during the CRPBL unit. The instructional process placed students' background and prior knowledge as its primary focus. This led to students creating an emotional attachment to the problem which then increased the level

of student engagement. This research supports my conclusion that a PBL environment will increase student engagement, specifically emotional engagement. If the students create an emotional attachment to the problem it will increase student engagement during the unit.

June Callahan explored another way to incorporate problem-based learning (PBL) into a classroom by looking at the difference between student engagement in a flipped classroom using problem-based teaching strategies and student engagement in a traditional classroom using lecture-based teaching strategies. The participants were students from four nursing programs (Callahan 2018). There was a nonrandomized control group and a group that participated in the PBL unit. Data was collected from a 10-item pretest and posttests and a Student Course Engagement Questionnaire (SCEQ) to evaluate student engagement in both the PBL modules and the traditional lecture-based module.

The results showed a statistically significant difference in the engagement of nursing students in PBL activity module as opposed to engagements of students in the traditional lecture-based learning module. The results also showed that regardless of the type of nursing program student engagement was higher for the PBL activities in the flipped learning environment. The findings are important to my research because it shows me that a problem-based learning environment can increase student engagement even when blended with flipped learning. My research will also utilize the pretest and posttest to collect my data so it is important to know that it is a viable way to record student engagement.

A study done by McHarg et al, focused on student's engagement in their groups in a problem-based learning environment rather than the class as a whole. The participants were made up of 63 first-year students that had an average age of 27 years ranging from 22 to 41 years. They were divided into seven groups of eight students and one group of seven (McHarg et al, 2011). The engagement levels of individuals in each group were measured using an evaluated tool, Macgowan’s Group Engagement Measure (GEM) at week 18 and 31. It comprised of 37 questions and was measured on a Likert scale of 1-5 where the facilitator makes judgments about a student’s behavior within the group.

The Group Engagement Measure (GEM) mean sources and the facilitators quantitative written assessments showed a statistically significant positive relationship between individual group engagement scores and performance in the knowledge tests. The groups that were in the problem-based learning had a significantly higher score week 31 compared to week 18. Therefore those students who performed better on knowledge assessments engaged most with the PBL environment in their classrooms. This connects to my research by allowing me to see the correlation between student engagement during PBL and student assessment. This study also used a Likert scale to measure the data which will also be utilized in my own research.

There are also different types of problem-based learning. A research study done by Loren investigated the effects of traditional and e-PBL modules on engagement, content knowledge, and students' self-assessment and teacher assessment of problem-solving solutions. E-PBL is electronic Problem-Based Learning, so this research was conducted in an engineering module. The study was conducted over a 4-week period at Midwestern Junior High School in engineering classrooms. The participants were 37 sixth graders, 35 seventh graders, and 28 eighth graders (Baele 2017). The qualitative research was collected through 3,711 extended response comments, two field observations, and six student semi-structured interviews. The engagement in the e-PBL unit was collected using the daily student engagement surveys (SES) and was analyzed using a t-test.

The results found that there was statistical significance between self-reported engagement scores of the control and treatment groups. This implies that the e-PBL instruction engaged the student more than the traditional instruction in this module. This means that more students find e-PBL instruction to be more motivative and engaging than traditional instruction. My research is also focused on students' engagement in a problem-based learning environment so this research will help me reflect on how I think my students will respond to my PBL module vs how they will respond to a traditional instruction module.

I will also be conducting student research through interviews so it is important to know that it is a viable way to collect the data and can produce significant results.

Holthuis et al, developed a curriculum framework for Problem-Based Science Learning to boost student learning and implemented over the course of a three-year study. This study had sixth-grade science teachers at various schools and districts either participating as the experimental group or the control group. Participating teachers in the experimental group taught the NGSS-aligned course to 328 students in year two and to 347 students in year three. The participating teachers in the control group implemented their regular curriculum materials to 9,675 students in year two and to 7,935 students in year three (Holthuis et al 2018). Data was collected through interviews and surveys of the participating teachers and students and also through Smarter Balanced Assessment Consortium tests the students took during the three years.

The research showed that participating students scored 14 points higher in year two and 20 points higher in year three on their Smarter Balanced Assessment Consortium tests in math. In English Language arts they scored 9 points in year two and 8 points higher in three. This means that students were performing better in the PBL unit than in the traditional classroom. Also, the study found throughout the student surveys that students in the PBL classrooms felt that their classroom assignments were more interesting, challenging, and enjoyable than the student's surveys completed by the students in the traditional classrooms. This pertains to my research because I want to know that my students will be able to gauge their engagement levels just like the students in this study did. Also, this study looks at how that engagement level of the student affects their test scores over time which would be a reliable source to reference when looking at the cognitive engagement of my students.

Methodology

The research will be conducted at Springfield Middle School in Holland, Ohio. The participants are seventh-grade students, and the environment is a seventh-grade math classroom.

Data will be collected in the form of surveys, journal entries, teacher observations, and individual interviews with students over the course of two weeks. Week one will be taught using a traditional unit and week two would be taught using the PBL unit. Before week one students will take a pretest that gages the student's engagement levels on both a cognitive and emotional level in the form of a survey (attached at the bottom). Behavioral engagement will be assessed by an unbiased classroom observer that will come in twice during the first week and twice during the second week to take a sweep of the behaviors going on in the classroom. They will make tally marks for both positive, like students answering questions, and negative behaviors such as students not on task.

During the two weeks, two times a week students will fill out a journal entry that will show student engagement for that day. The journal entry will ask what the students learned that day, how they felt doing the activity, and what the students favorite part of the lesson was. After the first-week student will take a mid-test, the same survey as the pre-test, focusing on students cognitive and emotional engagement with the traditional unit. After the second week has been concluded students will then take a post-test which is the same survey they have taken twice before. At this time three student interviews will also be conducted to get qualitative data over student engagement during those two weeks. All students will also fill out a final journal entry focusing on the student's feelings towards the traditional unit versus the PBL unit. During these two weeks observation notes taken by the teacher will also be analyzed to make better sense of the quantitative data collected through student interviews and journal entries.

The PBL unit introduced to the students over two weeks is called “Road Trip.” Students are told that they have won a free road trip to anywhere they want in the United States. There is a

catch though. The contest sending them will only pay for the trip there and back and will not be paying for anything else. For this project students will plan out where they will go and what they will spend on one of the days of their trip. Students will use proportional relationships to solve multi-step percent problems throughout the project. Below is the PBL unit broken down by day.

DAY	STANDARD	ESSENTIAL QUESTION and GENERAL LESSON DESCRIPTION
1	N/A	Lesson: ● Video to introduce traveling ● Introduce problem/ talk about expectations ● Assign groups and pick a place to go
2	7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.	EQ: How can you use unit rates to solve real world problems? Lesson: ● Revisit proportional relationships ● Pick three locations to visit ● Make a scale model using google maps. (the scale factor must be a fraction) ● Find the actual distance between each location using the unit rate you choose.
3	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	EQ: How can you calculate cost with situations involving adding or subtracting a percentage of the initial amount? Lesson: ● Lesson on tax and tip ● Students will calculate the tax and tip from eating at local restaurants in their town. ● They will be recording all their calculations into a receipt provided for them. After students find the total, they are then to try to come up with an algebraic expression to represent finding the total cost given the subtotal and tax.
4	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	EQ: How can you calculate cost with situations involving adding or subtracting a percentage of the initial amount? Lesson: ● Lesson on interest (focus on finding simple interest) ● Find out how much you have in your bank account to spend (what will you have to spend money on?) ● Factor in interest
5	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and	EQ: How can you use proportional relationships to solve multistep percent problems? Lesson: ● Lesson on markups and markdowns ● Figure out which car you will rent by calculating the total cost for each after factoring in the markups and markdowns (Include tax).

	decrease, percent error	
6	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	EQ: How can you use proportional relationships to solve multistep percent problems? Lesson: ● Find out total cost for those 3 locations picked ● Find at least one coupon for each and factor into the total cost ● Include tax ● Include tip if applicable
7	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	EQ:What does it mean to have a percent error when talking about a real-world situation? Lesson: ● Lesson on Percent error ● 5 stations that groups will rotate through (each group is expected to hit at least 3 stations). Each station involves a different scenario that happened on their trip that involves percent error.
8	7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	● Students will finish putting their presentations together ● Complete reflection
9	N/A	PRESENTATIONS (gallery walk with other classes)
10	N/A	PRESENTATIONS (gallery walk with other classes)

Results

The pre, mid, and post surveys administered were focused on students' emotional and cognitive engagement during the traditional unit and the PBL unit. There were seven Likert Scale questions students were to respond to in the survey, Each question was on a scale 1-5 with

no neutral option, 5 being the most positive response. This means that each time a student took the survey the lowest score they could achieve was a 7 and the highest was 35. There were three questions focused on emotional engagement, which means the lowest score could have been 3 and the highest would be 15. For cognitive engagement there were four questions on the survey so the lowest score could have been 4 and the highest 20.

I assume that students average scores for both emotional and cognitive engagement would be higher after the PBL unit than the traditional unit. I am basing this off other research studies explored earlier in this paper. However, I also believe that the difference would not be statistically significant after completing a T-test. Most of the research discussed earlier showed similar results.

Conclusion

Though the results would most likely not be statistically significant, I still believe there would be an increase in student emotional, cognitive, and behavior engagement during the PBL unit. I also think that through the journals and individual interviews, students would show a preference for the problem-based learning unit over the traditional unit. My students greatly enjoy real-world problems and feeling like they are discovering the concept on their own. The PBL unit is centered around student choice and real-world problems. Through the interviews and journals, I believe that most students would lean more positively towards the PBL unit over the traditional unit. I also believe that through the unbiased classroom observer, there will be fewer negative behaviors displayed and more positive behaviors during the PBL unit.

There are, however, many limitations to this research. The first limitation was the sample size was too small. The research was only being conducted with one class of 35 students. Factor

in absences, and that means a very small sample size. If I had a larger sample size, I believe that would have helped make my data statistically significant. More students equal more data. If I were actually to conduct this research I would choose a larger sample size such as multiple classes. Another limitation was how long this research was conducted. I believe that if I were to do multiple PBL units over the course of a year with my students, I would have been able to collect more data that would have been statistically significant. Because this was only one PBL unit over the course of two weeks, there is not a lot of data to collect.

The last limitation was the fact that I was not able to conduct this research with my class because of the pandemic outbreak, COVID-19. Since this outbreak, my classroom mentor teacher has taken back control of the classroom, meaning students were not able to participate in the research. If I were to conduct this research again in the future, I would have not only an in-class PBL unit but also an online version ready if need be. You never know what will happen as anything is possible, but it is essential to plan for the worst.

I greatly wish I was able to conduct this research with my students. When discussing the PBL unit with students, they were genuinely excited to be able to experience it. I believe my students would have been very engaged and actively participating during the PBL unit, as it is something they have not experienced before. When talking to students about it, they said that most of them have never done anything like that in math class before. I can not wait to one day conduct this research with my future classroom and be able to experience this in person.

Annotated Bibliography

Baele, L. C. (2017, January). *Middle School Engineering Problem Solving Using Traditional vs. e-PBL Module Instruction*. Retrieved April 14, 2019, from https://search-proquest-com.ezproxy.bgsu.edu/docview/2019181353?pq-origsite=summon&accountid=26417.

This study investigated the effects of traditional and e-PBL modules on engagement, content knowledge, and students' self-assessment and teacher assessment of problem-solving solutions. E-PBL is electronic Problem-Based Learning, so this research was conducted in an engineering module. The study was conducted over a 4-week period at Midwestern Junior High School in engineering classrooms. The engagement in the e-PBL unit was collected using the daily student engagement surveys (SES) and was analyzed using a t-test. The results found that there was statistical significance between self-reported engagement scores of the control and treatment groups which implies that the e-PBL instruction engaged the student more than the traditional instruction in this module. I hope to see student engagement also increase in a PBL environment vs a traditional learning environment in my study.

Boren, R. (2012). *Examining student engagement and self-efficacy in a second-grade mathematics problem based learning unit*. Retrieved April 14, 2019, from https://libraetd.lib.virginia.edu/public_view/j96021060.

The research was over a Javits project funded through the U.S Department of Education. The study followed one group of students from 2nd to 3rd grade. Ten elementary schools participated for a total of 465 students in 31 different classrooms. Five randomly assigned schools participated in a PBL mathematics unit for both years, and five randomly assigned schools participated as a control group with only traditional instruction in their classrooms. The qualitative research found

that the classroom with the highest engaged students was a more student-centered classroom. The teacher in this study allowed the students to have the autonomy necessary to become deeply invested in the material and established an environment where students felt comfortable and confident enough to ask questions and show their work. I hope to also develop this type of classroom environment in my study and reflect the same results.

Callahan, J. (2018, January). *The Efficacy of Problem-Based Teaching Strategies on Facilitating Student Engagement in a Flipped Learning Module*. Retrieved April 14, 2019, from https://search.proquest.com/docview/2028098355?pq-origsite=summon&accountid=26417.

This study explored the effects of incorporate problem-based learning (PBL) into a classroom by looking at the difference between student engagement in a flipped classroom using problem-based teaching strategies and student engagement in a traditional classroom using lecture-based teaching strategies. The participants were students from four nursing programs. Data was collected from a 10-item pretest and posttests and a Student Course Engagement Questionnaire (SCEQ) to evaluate student engagement in both the PBL modules and the traditional lecture-based module. The results showed that regardless of the type of nursing program student engagement was higher for the PBL activities in the flipped learning environment. I also hope to see this reflected in my research.

Delialioğlu, Ö. (2012). Student Engagement in Blended Learning Environments with Lecture-Based and Problem-Based Instructional Approaches. *International Forum of Educational Technology & Society, 15*(3), 310-322. Retrieved April 14, 2019, from https://www.jstor.org/stable/pdf/jeductechsoci.15.3.310.pdf?refreqid=excelsior%3A2f42f462a6cec30062759e7dd59379fc.

This study conducted by Delialioğlu compared the level of cognitive engagement students have in a problem-based blended learning environment to a lecture-based blended learning environment. This research focused on a computer network course over a two-semester period that was implemented as a blended learning course at a large public university. The participants of this study were 93 junior pre-service teachers: 38 enrolled for one semester and 55 for the next semester. After analyzing the data, it was found that the level of students engagement outcomes and the total time on task was higher in the problem-based portion of the blended course compared to the lecture-based portion. The study also found that while students were satisfied with both types of blended learning for the course, students were more engaged with active learning strategies during the problem-based learning part of the blended course. I hope to see this reflected in my own research on cognitive engagement.

Derham, T. R. (2012, February). *Problems with engagement: Problem based learning strategies effect on engagement in middle grades technology education classes*. Retrieved April 14, 2019, from https://search.proquest.com/docview/992950948?accountid=26417&pq-origsite=summon .

This research explored the impact of combining problem-based learning with culturally responsive pedagogy on the engagement of African American students. The participating were 4-5 high school classrooms with teachers who have completed a professional development course focused on developing culturally responsive PBL's in Cleveland, Ohio. Through the collection of the data, it was identified that there were multiple aspects of the unit that lead to the increase of student engagement. One was the autonomy allowed within the culturally responsive PBL unit. A common theme among the research done with problem-based learning. Another was the multiple instructional strategies teacher developed to differentiate throughout the CRPBL unit.

Lastly, the student's emotional attachment to the problem increased student engagement during the CRPBL unit. I hope to see students create a similar emotional attachment to the PBL unit in my research.

Holthuis, N., Deutscher, R., Schultz, S. E., & Jamshidi, A. (2018, June 11). The New NGSS Classroom. Retrieved April 15, 2019, from https://www.aft.org/ae/summer2018/holthuis

These researchers developed a curriculum framework for Problem-Based Science Learning to boost student learning and implemented in over the course of a three-year study. This study had sixth-grade science teachers at various schools and districts either participating as the experimental group or the control group. Data was collected through interviews and surveys of the participating teachers and students and also through Smarter Balanced Assessment Consortium tests the students took during the three years this research was conducted. The research showed that participating students scored 14 points higher in year two and 20 points higher in year three on their Smarter Balanced Assessment Consortium tests in math. In English Language arts they scored 9 points in year two and 8 points higher in three. The study also found that students in the PBL classrooms felt that their classroom assignments were more interesting, challenging, and enjoyable than the student's surveys completed by the students in the traditional classrooms. I hope to also see these results in my research on the effects of problem-based learning on student engagement.

McHarg, J., Kay, E. J., & Coombes, L. R. (2011). Students' engagement with their group in a problem-based learning curriculum. *European Journal of Dental Education, 16*(1). doi:10.1111/j.1600-0579.2011.00682.x

This research focused on student's engagement in groups in a problem-based learning environment rather than the class as a whole. The participants were made up of 63 first-year students that had an average age of 27 years ranging from 22 to 41 years. The engagement levels

of individuals in each group were measured using an evaluated tool, Macgowan's Group Engagement Measure (GEM) at week 18 and 31. The Group Engagement Measure (GEM) mean sources and the facilitators quantitative written assessments showed a statistically significant positive relationship between individual group engagement scores and performance in the knowledge tests. The groups that were in the problem-based learning had a significantly higher score week 31 compared to week 18. I hope to see the same results reflected in my own research.

PBLWorks. (n.d.). What is PBL. Retrieved April 15, 2019, from https://www.pblworks.org/what-is-pbl

PBLworks is an educational website that offers many articles and videos over problem-based learning and its effects on students and classrooms. This specific article describes what problem-based learning is in the world of education. They define PBL as a teaching method where students investigate and respond to authentic and engaging problems and challenges in the classroom. PBl is meant to prepare students for academic, personal, and career success.

Rotgans, J., & Schmidt, H. (2011, October). Cognitive engagement in the problem-based learning classroom. Retrieved April 15, 2019, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3167368/

This study researched to what extent autonomy in problem-based learning results in cognitive engagement. This studies consisted of students, twenty years old, enrolled in science-related modules in Singapore where the primary instructional method was problem-based learning. The study measured the situational cognitive engagement and academic achievement of these participants using surveys and final course grades. The study found a significant increase in students cognitive engagement when students moved

from the self-study phase of PBL to the sharing stage. This suggests that the level of autonomy involved in problem-based learning increases students engagement. I hope to see this in my own research.

TEAL Center staff. (n.d.). Student-Centered Learning. Retrieved April 14, 2019, from https://lincs.ed.gov/sites/default/files/6%20_TEAL_Student-Centered.pdf

This article was written by The Teaching Excellence in Adult Literacy (TEAL) Center and is about student-centered learning. The article defines student-centered learning as an approach to learning in which students choose not only what to study but also how and why. The benefits of student-centered learning listed in this article are as follows: learner motivation and actual learning increase when learners have a stake in their learning, learners gain self-confidence and learners demonstrate higher achievement when they can attribute success to their own abilities. The challenges listed in this article are that despite the benefits of student-centered learning, it is hard for instructors to be open to change and be able to challenge their own teaching beliefs and strategies.

Timeline

Fall 2019: Will finish collecting research
Spring 2020: Compile data, make conclusions and finish research paper.

Classroom Survey

Emotional Engagement Scale: Mark the best response to each item below regarding your beliefs about this class

1. I am eager to share my answers or ideas in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

2. I am happy in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

3. I am excited by the work in this class.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

Cognitive Engagement Scale: Mark the best response to each item below regarding your beliefs about this class

1. I pay attention in class.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

2. My mind wanders off topic during this class.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

3. After I leave this class, I think about and/or tell others about what I am learning.

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree

4. On my own time, I read, search the web, or watch videos/TV to learn more about things we are studying in this class

1	2	3	4	5
Strongly Disagree	Disagree	Somewhat Agree	Agree	Strongly Agree